POLLEN LOADS ON NEW HOLLAND HONEYEATERS AT QUALUP, WESTERN AUSTRALIA

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ABSTRACT

The composition, quantity and placement of pollen collected from five mist-netted New Holland Honeyeaters *(Phylidonyris novaehollandiae)* at Qualup, near Bremer Bay, in August 1977, was examined. Large amounts of *Lambertia inermis* pollen were found on all birds, predominantly in crown samples. Substantial quantities of *Banksia coccinea* and *Dryandra cuneata* pollen were found in beak samples, together with smaller quantities of *Eucalyptus preissiana* and *E. buprestium* grains. These observations suggest that New Holland Honeyeaters are effective pollen vectors and probable pollinators of several flowering plant species at Qualup.

INTRODUCTION

Although it is well known that honey-eating birds feed on and possibly pollinate Australian flowering plants, with the single exception of Paton and Ford's (1977) South Australian study, the identity, quantity and placement of pollen on honeyeaters has not been critically examined. Yet the demonstration that honeyeaters do actually transport the pollen of species on which they feed is central to any proposal that these birds are effective pollinators.

In the course of a study on interspecific hybridization between mallee eucalypts in the Fitzgerald River National Park (Hopper *et al.*, 1978), we mist-netted honeyeaters to determine whether they were carrying pollen of the eucalypt species under investigation. In the present publication we list all species of plants whose pollen was found on these honeyeaters, and briefly discuss the implications of our results in terms of pollination.

MATERIALS AND METHODS

Mist-nets were set up from 10 a.m. to 3 p.m. on August 17, 1977 in some open mallee heath 2 km N.E. of Qualup homestead (34°15'S, 119° 25'E) in the south-western sector of Fitzgerald River National Park. The study area was on a gradual hillslope to the east of the Gairdner River gorge. The vegetation was growing on sandy loam soil. Dominant species included *Lambertia inermis* and several mallee eucalypts *(Eucalyptus tetragona, E. buprestium, E. decipiens* and *E. preissiana).* Scattered individuals of *Banksia coccinea* and *Hakea victoriae* were also present.

Pollen was collected from netted birds by stroking the beak, forehead and crown feathers with a small brush over a glass slide covered with a thin veneer of vaseline. Separate slides were used for beak and crown samples. Similar preparations were also made for known individuals of likely bird-pollinated species in flower in the neighbourhood, including *Lambertia inermis, Dryandra cuneata, Eucalyptus pressiana, E. buprestium, Banksia coccinea, Calothamnus quadrifidus* and Qualup Bells *(Pimelea physodes).*

Maximum length and structural features of pollen grains of the known species were determined under a microscope using a micrometer eyepiece. Pollen samples collected from birds were then classified to species and the relative proportions of different grains determined from the total present on the slide.

RESULTS AND DISCUSSION

Pollen of all flowering species sampled in the study area and collected from honeyeaters was readily distinguishable on the basis of shape and/or size (Table 1). Even pollen grains of the two *Eucalyptus* species were identifiable in the majority of cases.

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TABLE 1.—SHAPE AND SIZE OF IDENTIFIABLE POLLEN CARRIED ON NEW HOLLAND HONEYEATERS AT OUALUP.

Plant species	Pollen shape	Pollen length (μm)
Lambertia inermis	triangular	63.1 - 76.2
Eucalyptus preissiana	triangular	25.9 - 33.7
Eucalyptus buprestium	triangular	21.9 - 27.7
Banksia coccinea	elliptical	60.9 - 75.8
Dryandra cuneata	elliptical	32.6 - 35.3

Five New Holland Honeyeaters (*Phylidonyris novaehollandiae*) were captured during the netting period, and all were found to be carrying pollen. The largest loads were of *Lambertia inermis, Dryandra cuneata* and *Banksia coccinea* (Table 2). A small percentage of *Eucalyptus preissiana* and *E. buprestium* pollen was also found, as well as approximately seven different kinds of grains which did not match any of the known species sampled. No pollen grains of Qualup Bells (*Pimelea physodes*) were found in any of the samples examined. This latter observation was somewhat unexpected, since several Qualup Bells were flowering in the study area and Keighery (1975) has reported observing Tawny-crowned Honeyeaters (*Phylidonyris melanops*) feeding on the species in the Fitzgerald River National Park. Our pollen counts suggest that New Holland Honeyeaters fed on Qualup Bells very rarely (if at all) in the study area. Perhaps the Bells are visited more frequently in areas where other bird-pollinated plants are at a much lower density than those which occurred in our netting site.

A clear difference in the proportions of *Lambertia, Dryandra, Banksia* and *Eucalyptus* pollen on beak and crown samples was found with *Lambertia* grains predominating in crown samples and the largest number of *Dryandra, Banksia* and *Eucalyptus* grains occurring in beak samples (Table 2). This difference agrees with the size and mechanical

TABLE 2.—PERCENTAGE COMPOSITION OF POLLEN SAMPLED FROM CROWN AND BEAK SAMPLES ON ONE NEW HOLLAND HONEYEATER AT OUALUP.

Species	% of total grains scored	
	Crown sample (993*)	Beak sample (636*)
Lambertia inermis	98.8	28.0
Dryandra cuneata	0.1	37.3
Banksia coccinea	0.0	32.1
Eucalyptus preissiana	0.9	0.1
Eucalyptus buprestium	0.0	1.4
Unknowns	0.2	1.1

*Total number scored.

relationships of the various flowers and the heads of New Holland Honeyeaters. The protostigma of *Lambertia inermis* usually rubs against the crown of a feeding honeyeater whereas the anthers of *Dryandra, Banksia* and *Eucalyptus* reach only as far as the base of the beak (this is illustrated for *Eucalyptus* in Hopper *et al.*, 1978).

It is evident from the pollen loads that New Holland Honeyeaters at Qualup are catholic in their choice of food plants, rather than species-specific. This agrees with observations of opportunistic and indiscriminate honeyeater foraging reported elsewhere, e.g. Paton and Ford (1977). However, the precise feeding patterns adopted in the study area remain unelucidated. It would be of interest to know how the honeyeaters partition their time in feeding on the different species in flower. Other studies have shown that honeyeaters may be extremely selective in their choice of food plants at a given place and time, concentrating on the species providing the greatest energy return and virtually ignoring other species in flower in the neighbourhood (e.g. Hopper and Burbidge, 1978). If such preferential behaviour was operative among the New Holland Honeyeaters at Qualup, they would clearly constitute a powerful selective force on the phenology, floral morphology and nectar secretion of plant species competing for pollinator service.

While the present study has established that New Holland Honeyeaters do transport pollen of and probably pollinate several plant species at Qualup, further research is needed to provide a satisfactory understanding of the ecological interactions and evolutionary responses of participants in this pollination system.

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OBSERVATIONS ON WIND-BLOWN SUPERPHOSPHATE IN NATIVE VEGETATION

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INTRODUCTION

Vegetation on wheatbelt reserves is often seen to be taller and denser adjacent to paddocks than is observed deeper into the reserve. On occasions this can be attributed to increased drainage from the adjacent farmland but is also observed uphill from some paddocks. Muir (1977) records an instance of increased foliage density, increased number of fruit, and changes in floristics when fertilisers affect roadside vegetation. Stimulation of growth rates after contact with fertiliser are also documented (Bradshaw *et al.*, 1964; Driessche and Wareing, 1966). An uncertainty in many observations is whether the phosphate enters the reserve or road verge as windblown material or as a subsurface solution. The former was suspected because phosphate movement in soil is very limited, particularly in light sandy soil (Russell, 1961). Additionally, in many wheatbelt areas there are strong north-westerly winds during the periods of ploughing and fertiliser application, and at which times dust is likely to enter bushland. Particles of fertiliser may be transported considerable distances at this time. Observations of superphosphate particles undergoing saltational wind transportation along a firebreak 1 km into a reserve from the nearest cleared land have been made at Bendering Reserve (Muir, 1977).

This paper presents the results of two observations made on phosphate levels in light sandy soils in the Wongan Hills area.